WHAT IS CLAIMED IS:

1. A method for monitoring temperature in at least one location of an electromagnetic coil assembly, the electromagnetic coil assembly having at least one electrical winding, said method comprising:

passing a light through a non-magnetic optical fiber inserted in a non-magnetic sheath wound and cast with the electrical winding, the optical fiber having a core containing at least a first Bragg grating etched therein;

detecting a wavelength of light reflected from the first Bragg grating; and

determining a temperature of the electromagnetic coil assembly at a location of the first Bragg grating utilizing the detected wavelength of the light reflected from the first Bragg grating.

2. A method in accordance with Claim 1 wherein said passing a light through an optical fiber comprises passing light from a laser through the optical fiber.

3. A method in accordance with Claim 1 wherein the core of the optical fiber has a plurality of Bragg gratings etched therein at different lengths along the fiber, and wherein the Bragg gratings in the wound optical fiber are disposed at different locations in the electromagnetic coil assembly; and further comprising:

detecting a wavelength of light reflected from at least a second Bragg grating at a location spaced apart from the location of the first Bragg grating; and

determining a temperature of the electromagnetic coil assembly at least at a location of the second Bragg grating utilizing the detected wavelength of the light reflected from the second Bragg grating.

4. A method in accordance with Claim 3 wherein said passing a light through an optical fiber comprises passing light from a variable frequency laser through the optical fiber.

5. A method in accordance with Claim 4 further comprising distinguishing reflected light from the at least a second Bragg grating from reflected light from the first Bragg grating utilizing optical frequency domain reflectometry.

6. A method in accordance with Claim 4 further comprising distinguishing reflected light from the at least a second Bragg grating from reflected light from the first Bragg grating utilizing optical time domain reflectometry.

7. A method in accordance with Claim 4 further comprising distinguishing reflected light from the at least a second Bragg grating from reflected light from the first Bragg grating utilizing intensity based reflectometry.

8. A method in accordance with Claim 3 wherein light reflected from a plurality of Bragg gratings is used to monitor temperature at a plurality of locations in the electromagnetic coil assembly.

9. A method in accordance with Claim 3 wherein the electromagnetic coil assembly is in an electric machine.

10. A method in accordance with Claim 3 wherein the electromagnetic coil assembly is in a magnetic resonance imaging system.

11. A method in accordance with Claim 3 further comprising cooling the electromagnetic coil assembly in accordance with the determined temperatures.

12. A method in accordance with Claim 1 further comprising passing a current through an electrical winding of the electromagnetic coil assembly.

13. An electromagnetic coil assembly kit comprising:

an electrically conducting electromagnetic winding, and a non-magnetic sheath wound and cast therein;

a non-magnetic fiber optic fiber configured for insertion in the sheath and having distributed therein a plurality of Bragg gratings each configured to reflect

light indicative of temperature at a location of the Bragg gratings in the electromagnetic coil assembly.

14. An electric machine comprising an electromagnetic coil assembly kit in accordance with Claim 13.

15. A magnetic resonance imaging apparatus having an electromagnetic coil assembly kit in accordance with Claim 13, wherein said electromagnetic winding is configured as a gradient coil or a main MRI magnet.

16. A magnetic resonance imaging apparatus in accordance with Claim 15 wherein the fiber optic fiber is inserted in the sheath.

17. A measuring apparatus for temperature comprising:

an electromagnetic coil assembly having an electrically conducting electromagnetic winding, a non-magnetic sheath wound and cast therewith, and a non-magnetic fiber optic fiber inserted in the sheath and in thermal communication with the electromagnetic winding, said fiber optic fiber having distributed therein a plurality of Bragg gratings each configured to reflect light indicative of a temperature at a location thereof;

a light source configured to pass light into the fiber optic fiber;

a reflected light sensor configured to sense light reflected back from the Bragg gratings; and

a processor responsive to the reflected light sensor to determine temperature utilizing said reflected light.

18. A temperature measuring apparatus in accordance with Claim 17 wherein said light source is a laser.

19. A temperature measuring apparatus in accordance with Claim 18 wherein said laser is a variable frequency laser.

20. A temperature measuring apparatus in accordance with Claim 19 wherein said processor is configured to utilize optical frequency domain reflectometry to determine said temperature.

21. A temperature measuring apparatus in accordance with Claim 19 wherein said processor is configured to utilize opticial coherence domain reflectometry to determine said temperature.

22. A temperature measuring apparatus in accordance with Claim 19 wherein said processor is configured to utilize intensity based reflectometry to determine said temperature.

23. A temperature measuring apparatus in accordance with Claim 17 wherein said processor is configured to at least one of turn off current through the electromagnetic winding, or provide additional coolant or ventilation when a determined temperature exceeds a limit.

24. A magnetic resonance imaging apparatus having a temperature measuring apparatus in accordance with Claim 23, and further wherein said electromagnetic winding is configured as a gradient coil.

25. A magnetic resonance imaging apparatus having a temperature measuring apparatus in accordance with Claim 17, and further wherein said electromagnetic winding is configured as a gradient coil.